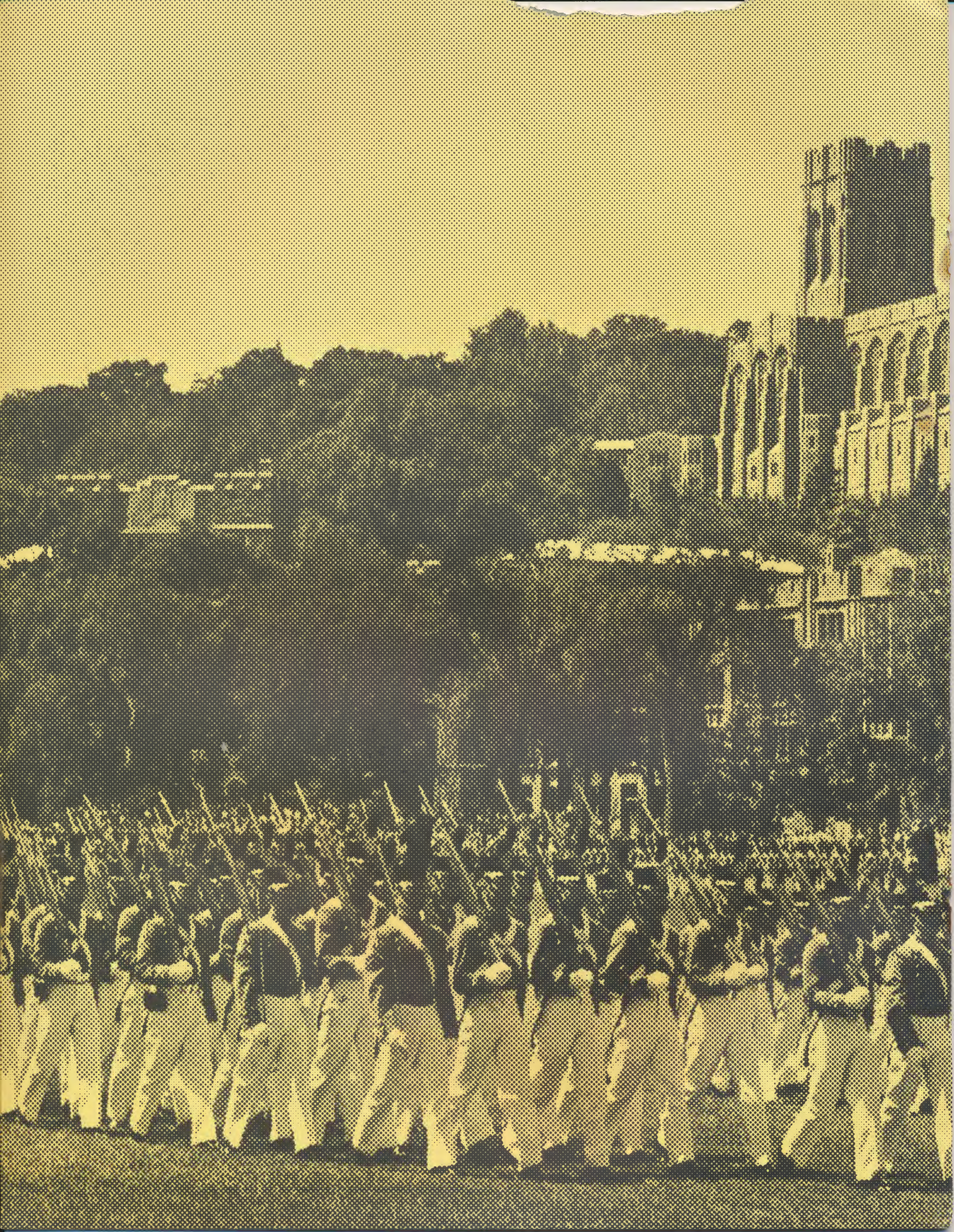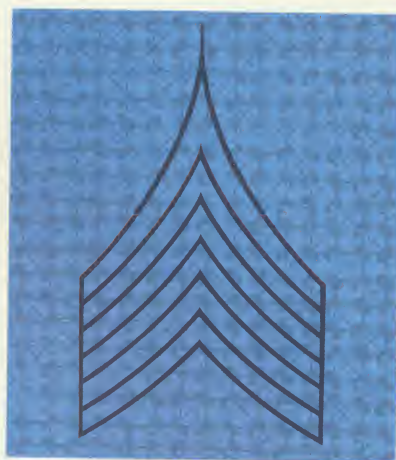# GENERAL ELECTRIC
COMPUTERS
AT THE UNITED STATES
MILITARY ACADEMY

GENERAL ⊕ ELECTRIC

The United States Military Academy at West Point, New York uses electronic computers and communication processors to help meet the challenge of today's explosive growth of knowledge. At this forward-looking center of higher learning, modern teaching techniques are only part of the story. Unique in American education, required "hands-on" computer instruction trains all cadets at the Academy to formulate their own problems, program their efforts, and understand computer operation. To do this they use three General Electric GE-225 computers, a DATANET-30 Communications Processor, and direct access remote terminals which allow cadets and staff to use the computer from several remote locations.

Academy Philosophy

Why all this emphasis on computer science instruction? The Academy
and a growing number of other perceptive educational institutions
recognize that computers are vital to the nation's future leaders, both
military and civilian. They feel that these future leaders must be
confident that they can properly apply, control, and supervise
computers and evaluate the significance of computer-produced results.

At the Academy, cadets are taught that computers are important
military tools, not only in logistics and administrative work, but as
components of complex weapons systems. But even further, computers
are considered important to the broad collegiate education in the
arts and sciences.

How General Electric Equipment is Used

The GE-225's at the Academy are used in many ways. The Mathematics Department requires use of the computers specifically as tools to demonstrate and clarify basic concepts of mathematics. In the social sciences, they are used with modern techniques of economic analysis which are completely impossible without a computer. In physics and electricity courses, the GE-225's aid in solving complex electrostatic and electromagnetic problems which would be impractical to solve otherwise.

And, highly important, the computers contribute to the traditional strong points of a USMA education. By improving student/instructor feedback, the interplay between student and instructor is intensified. The 225's also permit dynamic demonstrations in classroom teaching, adding interest and meaning to the instruction. They simplify the growing burden of administration and the development and analysis of academic statistics.

The Academic Computer Center

Applying computers to such a wide variety of disciplines required the development of an integrated computer center facility. This facility, operating directly under the Dean of the Academic Board, provides the entire Academy with computing capabilities which could not have been developed by an individual department. Here, the Academy gives the cadet a minimum of formal instruction in computer techniques, but a maximum of direct individual exposure to, and practical use of, computers.

How does this work? Computer science is a compulsory course. On the first academic day of the school year, the cadet Plebe (freshman) is introduced to using the GE-225. He uses a Basic Programming Language specifically developed by the Academy. This language is easy to learn, easy to use, and provides an excellent, uniform means for communicating with the computer. Each cadet is required to solve five mathematical problems on the GE-225. His formal instruction is minimum and is greatly outweighed by the practical, hands-on method of teaching computer use. The GE-225 thus becomes a tool in the laboratory, in mathematics, in science courses, in civil engineering, and in management, to mention only a few.
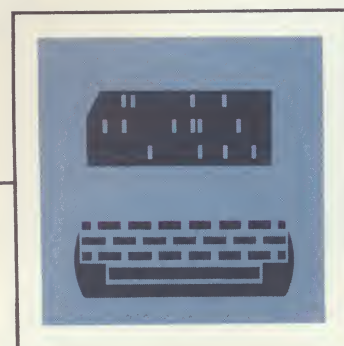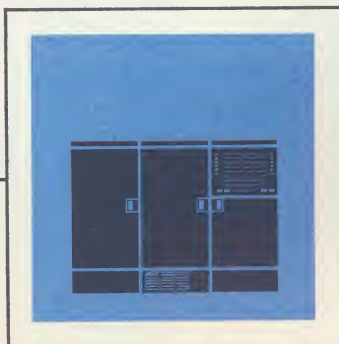
A secondary, though highly important, function of the computer, is that it teaches logical thought patterns. The Academy uses a step-by-step process which each cadet must follow. It includes:

1. Recognize problem

2. Define problem precisely

3. Develop plan of action to solve problem

4. Complete methods analysis

5. Write computer program precisely and logically

6. Prepare problem card deck

7. Operate computer

8. Evaluate results

This kind of program brings more intensified use of the computer and thus a better understanding of other courses in science, engineering, and mathematics.

In addition, simple and direct mass input techniques developed by the Director of the Academic Computer Center have made it practical to extend the benefits of the computer to every student without a corresponding increase in supporting punched card equipment.

Currently, over 3000 cadet computer program solutions are processed each month, with the number rising rapidly. The computer is always available to cadets for homework assignments, special projects, monographs, honors work, or for free experimentation. Cadets who want to operate the equipment personally may qualify for a "gray card" (qualified apprentice) or a "gold card" (fully qualified operator). Cadets earning a gold card may use the computer even when the Academic Computer Center is officially closed and members of the staff are not present. Cadets use the comprehensive library and programming consultation services available at the Academic Computer Center.

The Academic Computer Center instructional facilities include a 200-seat hall in which computer problem solutions may be demonstrated. Closed-circuit television, kinescope films, and a wide variety of audio-visual aids increase instruction efficiency. Special input/output devices such as a curve plotter and punched card equipment assist in the dynamic presentation of material to students.
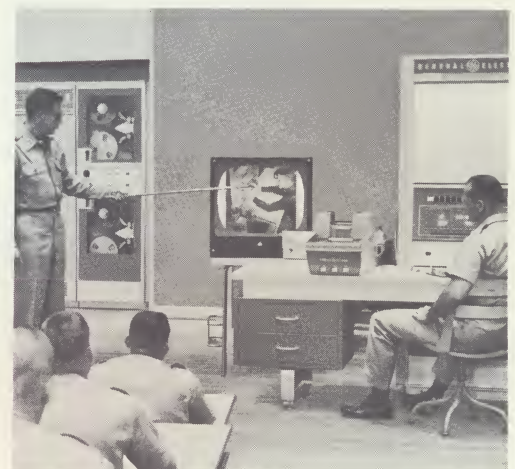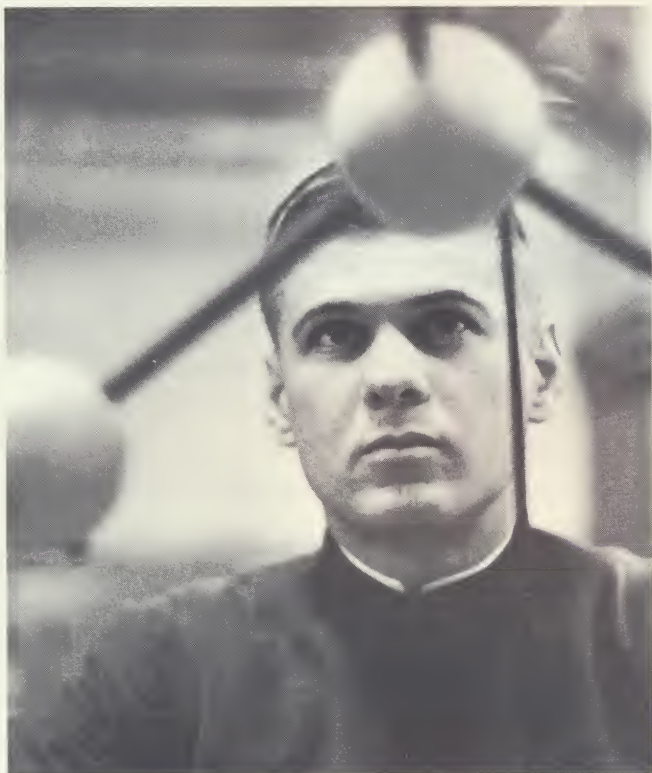
Also at West Point

The Military Academy has one of the most comprehensive computer teaching programs of any college or university in the country. A huge classroom, equipped with a GE-225 and a DATANET-30, and two adjoining classrooms with GE-225 computers placed on a raised, stage-like platform, will enable the Academy to teach the entire Corps of Cadets the art of computer operation and programming. At the completion of this instruction, the West Point cadet has learned the latest state-of-the-art in computer usage and communications techniques.

In addition, remote terminals will be located in various departments of the Academy so that cadets and staff members can use the computer without having to physically visit the computer room. With this system, anyone can simply step to one of the input stations and enter his problem. The DATANET-30 acts as a monitor for incoming programs and the remote terminals. It sorts out the problems and files them in a disc memory. Then, the GE-225 computers are assigned these problems (at the DATANET-30's command) for processing.

Thus, instead of cadets and staff members waiting in line to use the GE-225 while one program is being processed, they simply call the DATANET-30 from their nearest input location and enter their problem. They continue their regular work while waiting for the results. For the first time, all cadets and Academy personnel will have effective, almost simultaneous access to the computer. It will be almost as if each had a high-speed computer of his own to work with.
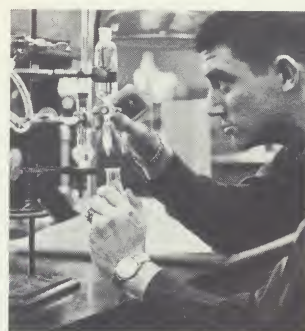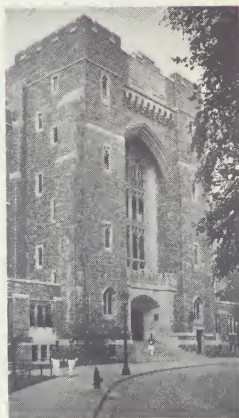
Potential

The United States Military Academy feels that the use of computers in education is in its infancy. For example, while the computer plays an important part in logistics and administrative work and as components of complex weapons systems, staff members are continually applying the computer to new applications such as simulated environments. They believe that their computers will become ever-increasingly valuable as educational tools.

In Education

More and more, universities, colleges, and secondary schools are beginning to use computers. As a result, computers can be used in a much more comprehensive way since the experience in academic applications has been proved successful.
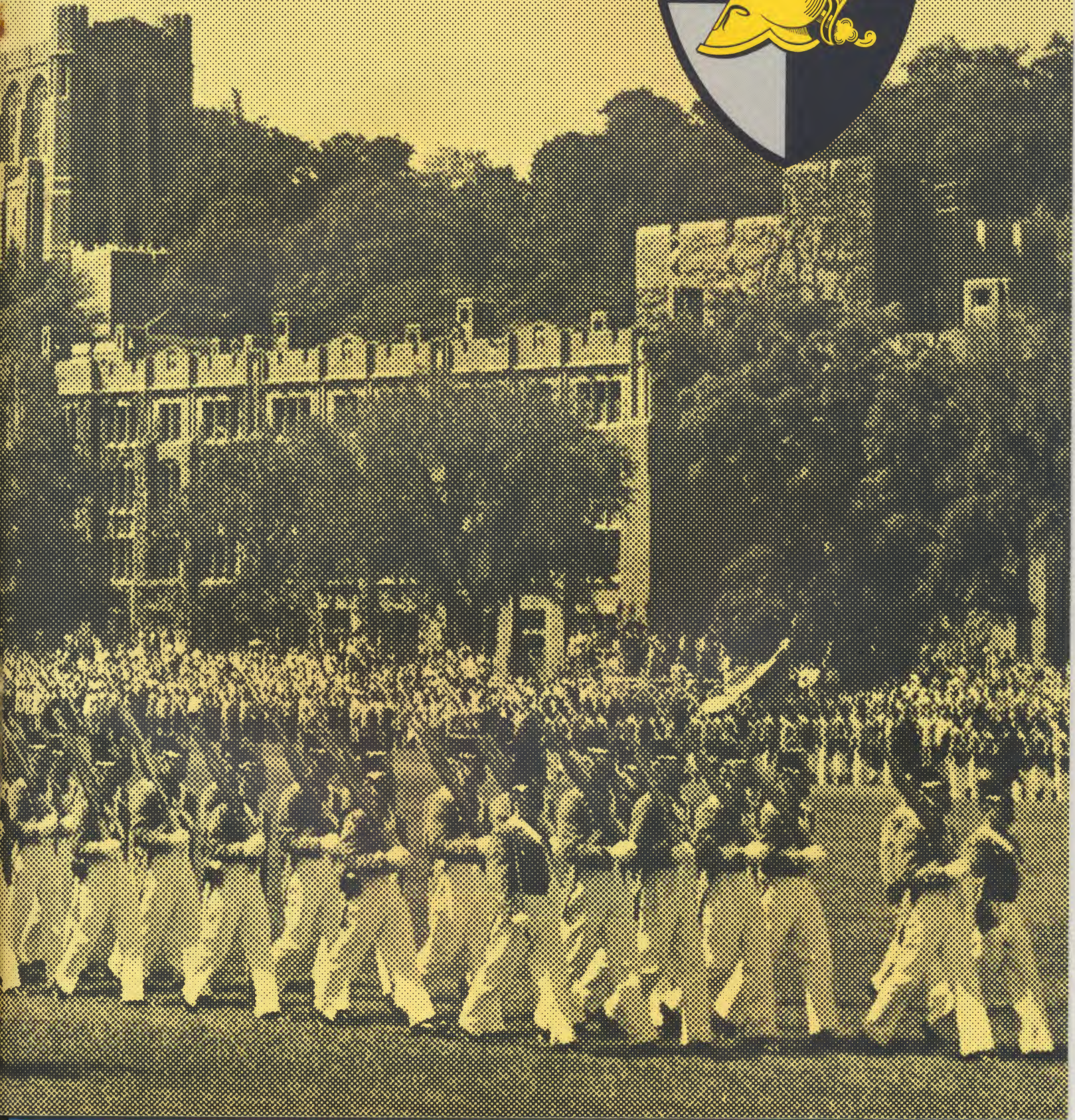
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